



Pathology Biology Section – 2003

G20 Autopsy Procedure and Findings in a Case of Inhalational Anthrax

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The goal of this paper is to present to the forensic community the autopsy procedures and findings in a case of inhalational anthrax so that the attendee can learn how to approach and what to expect in this type of case.

In the fall of 2001, there were eleven confirmed or suspected cases of inhalational anthrax of which 5 people died. Prior to the anthrax attacks in 2001, autopsy experience with inhalational anthrax was limited. Reporting the autopsy procedure and findings will make forensic pathologists aware of the precautions that need to be taken and of what to look for at autopsy in this hopefully rare type of case.

By report, this 47-year-old, Black male was an employee of the Brentwood postal facility in Washington, DC. He complained of "flu like" symptoms with a mild non-productive cough, sneezing, nausea, vomiting, and stomach cramps on October 16, 2001. While attending church on October 20 he had a brief self-limited syncopal episode and did not request transport to the hospital. Early the next day he went to the emergency room complaining of vomiting and profuse sweating. He was afebrile and had orthostatic hypotension and was treated with intravenous hydration and was released. Later that day he complained of myalgia, vomited and passed out again. Early in the morning of October 22 his wife found him unresponsive. On arrival to the emergency room he was afebrile, hypotensive, tachycardic and tachypnic. He required intubation and was treated with multiple intravenous antibiotics. Computerized tomography scans were remarkable for pleural effusions, perihilar infiltrates, probable mediastinitis, small bowel wall edema with small bowel air, portal venous air, and ascites. He had a progressively downhill course and was pronounced dead within six hours after arrival to the hospital. Gram stain of sputum and the buffy coat smear of the blood identified gram positive bacilli and direct fluorescent antibody test (dFA) and polymerase chain reaction performed by the Centers for Disease Control and Prevention (CDC) were positive for *Bacillus anthracis* on antemortem blood specimens. In addition, antemortem blood cultures grew *Bacillus anthracis* within 18 hours.

An autopsy, based on CDC recommendations that minimized the number and extent of procedures, was performed on October 22, 2001, using standard universal precautions in the isolation room at the OCME. It is recommended that the CDC be contacted prior to performing the autopsy for their suggestions and also to inquire about what type of specimens that they will require for future analysis. Three forensic pathologists and an autopsy assistant performed the autopsy. Since the organisms that one is dealing with at autopsy are vegetative bacteria and not spores, the primary, but minimal risks to personnel are through splashes to mucous membranes and skin injury. Therefore, the eyes, nose, mouth and any prior open skin defects must be covered and protection against cuts and puncture wounds is necessary. As the body warms up and is exposed to air, it is unclear if and when the bacilli can sporulate, therefore gross contamination of the environment that could eventually lead to spore formation should be limited.

Gross autopsy findings showed marked soft tissue edema, pleural effusions, ascites, multifocal mediastinal and mesenteric soft tissue hemorrhage with extension along the hilar and pulmonary parenchymal bronchi and blood vessels, mild pulmonary hilar lymphadenopathy, friable and hemorrhagic hilar lymph nodes, no gross pulmonary consolidation, and a portion of hemorrhagic distal small bowel without mucosal ulceration. The mesenteric lymph nodes, terminal ileum, and large bowel were unremarkable. The brain and cerebrospinal fluid were not examined. Microscopic examination revealed hemorrhagic necrotizing hilar lymphadenitis, mediastinal soft tissue hemorrhage with mildly increased acute and chronic inflammation, pulmonary perivascular and peribronchial hemorrhage, no evidence of pneumonia, and a section of small bowel with necrotizing infection extending from the periintestinal soft tissue to the lamina propria and not involving the mucosa. Brown and Brenn special stains showed gram positive rods consistent with *Bacillus anthracis* in the hilar lymph nodes, mediastinal soft tissue, lungs, affected small bowel, stomach, liver, kidneys, adrenals, and spleen. Postmortem blood culture for *Bacillus anthracis* was negative.

Post autopsy, the isolation room, all instruments, body tray, and outer body bag were washed with at least 10% bleach with at least five minutes of contact time. The body was triple bagged, placed in the freezer, and subsequently transported to the funeral home with the recommendation that mortuary care be limited to only what is necessary which included the avoidance of embalming and the consideration of cremation.

Investigation and autopsy determined that the cause of death was inhalational anthrax and the manner of death was homicide. The diffuse presence of gram positive bacilli in almost every organ indicates *Bacillus anthracis* sepsis. This report suggests an anthrax autopsy protocol and presents the autopsy findings. It emphasizes the relatively non-specific gross autopsy findings and the importance of clinical information, mutual cooperation with the CDC, and microscopic special studies that are required to make the proper determination as to the cause of death in this relatively rare type of case. In addition, it reinforces the fact that medical examiners play an important role in public health surveillance.



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